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Let $\sqrt{r^2 + 4a^2} = 2y - r$, $\frac{a}{2}(\sqrt{5} + 1) = y'$.

$$\begin{aligned}\therefore \Delta &= \frac{1}{6}\pi a^2 - \frac{1}{3}a^2 \sin^{-1}(\sqrt{5}-2) + \frac{\sqrt{a}}{3a} \int_a^{y'} \frac{(3y^2 + 3a^2 + 2ay)(y-a)^3 dy}{y^3 \sqrt{y}} \\ &= \frac{1}{6}\pi a^2 - \frac{1}{3}a^2 \sin^{-1}(\sqrt{5}-2) + \frac{\sqrt{a}}{3a} \int_a^{y'} (3y\sqrt{y} - 7a\sqrt{y} + 6a^2/\sqrt{y} - 6a^3/y\sqrt{y} \\ &\quad + 7a^4/y^2\sqrt{y} - 3a^5/y^3\sqrt{y}) dy = \frac{1}{6}\pi a^2 - \frac{1}{3}a^2 \sin^{-1}(\sqrt{5}-2) + \frac{2}{3}a^2[(86 - 13\sqrt{5}) \\ &\quad \times \sqrt{\frac{\sqrt{5}+1}{2}} - 128 + 11(11 - 2\sqrt{5})\sqrt{\frac{\sqrt{5}-1}{2}}].\end{aligned}$$

Solved with a different result by the PROPOSER.

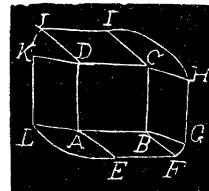
134. Proposed by G. B. M. ZERRE, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

An ellipse, semi-axes a, b , is placed on a square, side c . Find the chance that center of ellipse is on the square.

Solution by the PROPOSER.

Let $ABCD$ be the square, and let the ellipse move parallel to itself so that the major axis makes an angle θ with the side BC . Then the center of the ellipse will describe the area $GHIJKLMNOP$. Let $(a^2 - b^2)/a^2 = e^2$, p = chance. The perpendicular distance from BC to $GH = a\sqrt{(1 - e^2 \cos^2 \theta)}$, the perpendicular distance from DC to $IJ = a\sqrt{(1 - e^2 \sin^2 \theta)}$.

$$\text{Area} = \pi ab + c^2 + 2ac [\sqrt{(1 - e^2 \sin^2 \theta)} + \sqrt{(1 - e^2 \cos^2 \theta)}] = u.$$



$$1/p = \int_0^{4\pi} ud\theta / \int_0^{2\pi} c^2 d\theta = \frac{2}{\pi c^2} \int_0^{4\pi} ud\theta. \quad \therefore 1/p = [\pi ab + c^2 + \frac{8ac}{\pi} E(e, \frac{1}{2}\pi)]/c^2.$$

If $a=b$, $1/p = (\pi a^2 + c^2 + 4ac)/c^2$. If $a=b=c$, $1/p = \pi + 1 + 4$.

135. Proposed by LON C. WALKER, A. M., Graduate Student, Leland Stanford Jr. University, Cal.

If the line joining two points taken at random in the surface of a given circle be the diagonal of a square, the chance that the square lies wholly within the circle is $2 - 4/\pi$.

Solution by the PROPOSER.

Let MN be the line joining the random points M, N ; $MRNS$ the square; Q , its center; O , the center of the circle. Let the square move about the circle, so as to be within it, but in contact with it, the diagonal MN remaining parallel